CLAIMS

WHAT IS CLAIMED IS:

1. A method for manufacturing a high-pressure discharge lamp comprising a luminous bulb, in which a luminous substance is enclosed, and a sealing portion for retaining the airtightness of the luminous bulb, the method comprising the steps of:

(a) preparing a glass pipe designed for use in a discharge lamp, which pipe includes a luminous bulb portion that will be formed into the luminous bulb of the high-pressure discharge lamp, and a side tube portion extending from the luminous bulb portion; and

(b) forming the sealing portion from the side tube portion,

wherein the sealing-portion formation step (b) includes the steps of:

(c) preparing a compound glass tube that includes an outer tube made of a first glass and an inner tube made of a second glass, the outer tube being located in tight contact with the periphery of the inner tube, the second glass having a lower softening point than that of the first glass, the side tube portion being formed of the first glass;

(d) inserting the compound glass tube into the side tube portion, and then heating the side tube portion, thereby tightly attaching the side tube portion to the compound glass tube; and

(e) heating, after the attachment step (d), a portion including at least the compound glass tube and the side tube portion at a temperature higher than the strain point temperature of the second glass.

2. The method of claim 1, wherein the compound glass tube preparation step (c) includes:

inserting the inner tube made of the second glass into the outer tube made of the first glass, and

reducing pressure in a gap between the outer and inner tubes, and heating at least the outer tube, thereby bringing the outer and inner tubes in tight contact with each other.

3. The method of claim 1, wherein the heating step (e) is performed at a temperature lower than the strain point temperature of the first glass.

4. The method of claim 1, wherein the outer and inner tubes that form the compound glass tube are each composed of a single layer;

the first glass forming the outer tube contains 99 wt% or more of SiO_2; and

the second glass forming the inner tube contains SiO_2 and at least one of 15 wt% or less of Al_2O_3 and 4 wt% or less of B.

5. The method of claim 1, wherein the inner tube of the compound glass tube has a multilayer structure, while the outer tube thereof is composed of a single layer;

the outer tube is made of quartz glass; and

at least one of the multiple layers forming the inner tube is a glass layer made of glass which contains SiO_2 and at least one of 15 wt% or less of Al_2O_3 and 4 wt% or less of B.

6. A method for manufacturing a high-pressure discharge lamp comprising a luminous bulb, in which a luminous substance is enclosed, and a pair of sealing portions extending from both ends of the luminous bulb, the method comprising the steps of:

(a) preparing a glass pipe designed for use in a discharge lamp, which pipe includes a luminous bulb portion that will be formed into the luminous bulb of the high-pressure discharge lamp, and a pair of side tube portions extending from both ends of the luminous bulb portion; and

(b) inserting, into one of the pair of side tube portions, a compound glass tube and an electrode structure that includes at least an electrode rod, and then heating said one side

tube portion to cause said one side tube portion to shrink, thereby forming one of the pair of sealing portions,

wherein the compound glass tube includes an outer tube made of a first glass and an inner tube made of a second glass, the outer tube being located in tight contact with the periphery of the inner tube, the second glass having a lower softening point than that of the first glass, the side tube portions being formed of the first glass.

7. The method of claim 6, further comprising the steps of:

(c) introducing a luminous substance into the luminous bulb portion, after said one sealing portion has been formed;

(d) inserting, after said one sealing portion has been formed, a compound glass tube and an electrode structure that includes at least an electrode rod, into the other of the pair of side tube portions, and then heating said other side tube portion to cause said other side tube portion to shrink, thereby forming the other of the pair of sealing portions,

wherein the compound glass tube includes an outer tube made of a first glass and an inner tube made of a second glass, the outer tube being located in tight contact with the periphery of the inner tube, the second glass having a lower softening point than that of the first glass, the side tube portions being formed of the first glass; and

(e) heating the resultant lamp assembly, in which both the sealing portions and the luminous bulb have been formed, at a temperature higher than the strain point temperature of the second glass but lower than the strain point temperature of the first glass, where the lamp assembly includes at least the compound glass tubes and the side tube portions.

8. The method of claim 6, wherein the compound glass tube and the electrode structure are formed into one body.

9. The method of claim 1, wherein the heating step (e) is performed for 2 hours or more.

10. The method of claim 7, wherein the heating step (e) is performed for 2 hours or more.

11. The method of claim 9, wherein the heating step (e) is performed for 100 hours or more.

12. The method of claim 10, wherein the heating step (e) is performed for 100 hours or more.

13. The method of claim 1, wherein the heating step (e) is performed so that when the sealing portion is measured by a sensitive color plate method utilizing a photoelastic effect, a compressive stress of from 10 kgf/cm^2 to 50 kgf/cm^2 inclusive extending in the longitudinal direction of the side tube portion is present in the region formed of the second glass.

14. The method of claim 7, wherein the heating step (e) is performed so that when the sealing portions are measured by a sensitive color plate method utilizing a photoelastic effect, a compressive stress of from 10 kgf/cm^2 to 50 kgf/cm^2 inclusive extending in each said sealing portion in the longitudinal direction of the side tube portion is present in the region formed of the second glass.

15. The method of claim 14, wherein the compressive stress is generated in each of the pair of sealing portions.

16. The method of claim 6, wherein the electrode structure includes the electrode rod, a metal foil connected to the electrode rod, and an external lead connected to the metal foil; and

the compound glass tube is inserted into the side tube portion so that the compound glass tube covers at least the connection portion of the electrode rod and the metal foil.

17. The method of claim 6, wherein the first glass contains 99 wt% or more of SiO_2, and

the second glass contains SiO_2 and at least one of 15 wt% or less of Al_2O_3 and 4 wt% or less of B.

18. The method of claim 7, wherein the high-pressure discharge lamp is a high-pressure mercury lamp, and

mercury serving as the luminous substance is enclosed in an amount of 150 mg/cm^3 or more, which is determined based on the internal volume of the luminous bulb.

19. A glass tube designed for use in a high-pressure discharge lamp, the tube comprising:

an outer tube made of quartz glass, and

an inner tube formed inside and in tight contact with the outer tube,

wherein the inner tube is made of glass having a lower softening point than that of the quartz glass.

20. A lamp element designed for use in a high-pressure discharge lamp, the element comprising:

an electrode structure including an electrode rod, a metal foil connected to the electrode rod, and an external lead connected to the metal foil; and

a glass member formed in tight contact with the electrode structure so that the glass member covers the electrode structure at least where the electrode rod is connected with the metal foil,

wherein the glass member has a multilayer structure,

a surface layer of the glass member is made of quartz glass, and

a layer located inside the surface layer is made of glass having a lower softening point than that of the quartz glass.